LEARNING OBJECTIVES

1) Explore the use of a commercial data acquisition system
2) Communicate with the DAQ device and learn about settings for sampling rate and range
3) Discuss differences in data acquired with two different systems, an oscilloscope and a DAQ device
4) Demonstrate the response of an analog temperature sensor as a first order system

EQUIPMENT SETUP

See the materials provided to see how to set up the myDAQ.

ACTIVITIES

You may work in a group of up to two students on this activity, but you must turn in separate reports.

Activity 1) myDAQ from National Instruments and MATLAB

Getting Started with myDAQ: Example code for using the myDAQ can be found at the link below.

https://www.mathworks.com/matlabcentral/fileexchange/40749-getting-started-with-ni-mydaq

You can also find the sample code and information regarding wiring in the background material for this challenge. Follow along with the steps in the link above to get the myDAQ connected to MATLAB.

Using the function generator, produce a **35 Hz sine wave with 750 mV peak-peak sine wave**. Check the sine wave using the Tetronix oscilloscope. You will need to t-junction BNC connector at the output of the function generator so that the signal can be sent simultaneously to the myDAQ and into MATLAB. You will be comparing the sine wave that is sampled from both the myDAQ and the oscillioscope, you would expect the signal from the function generator will be acquired with the same frequency and magnitude indicating on both devices.

The example in the Getting Started file will tell you how to set the sampling rate using MATLAB commands, it will also show you how to set the input range on the device.

Note the magnitude and frequency from the oscilloscope. Pictures of the screen readings would be helpful for your writeup!

Note the magnitude and time period of the sine wave in MATLAB, and compute the frequency from the period. You may need to remember how to use some additional commands in MATLAB, so be prepared to refer back to your ME3001 notes or use the really useful HELP feature in MATLAB

Compare the magnitude and frequency from each device.

Discuss the possible sources of error in the systems that might account for any discrepancies.

Activity 2)

Generate a **1000 Hz sine wave with 4.5 V peak.** Acquire the signal with BOTH devices, the oscilloscope and the myDAQ – MATLAB system. You will have to make changes to settings in the MATLAB setup. Think carefully what your sampling rate should be and what range you will need on the input. Compare the sine wave you acquire from both devices. Discuss what you see in your images.

Activity 3) Capture Analog Sensor Response

Use the DAQ device to capture the output signal from the temperature sensor (TMP36) as a series of voltage readings over time. Write a MATLAB program to plot this data, and be sure to label the axis and show units.

Refer to the background material for information on how to connect the sensor to the DAQ system. First check that you are getting a reasonable reading. Let the sensor settle at room temperature, then expose the sensor to a step change in input temperature by quickly pressing the sensor between your thumb and finger. This should change the input temperature to the sensor from ambient temperature to your skin's temperature. Record the response of the system with the DAQ device over a reasonable range of time.

Determine the static sensitivity of the sensor from the datasheet provided and plot data with the measured temperature plotted as a function of time.

Optional (complete if you have time)

Activity 4) Log Analog Input Data to a File

https://www.mathworks.com/help/daq/log-analog-input-data-to-a-file-using-ni-devices.html

For practical purposes, it is useful to save the data you have in MATLAB into a file. Read the instructions in the link above and try this activity if you have time.

Hardware support package – You could install the hardware support package on your personal computer.

https://www.mathworks.com/hardware-support/ni-mydaq.html